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APPLICATION  
FOR  
UNITED STATES LETTERS PATENT

TITLE: BEDDING SANITIZER

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## BEDDING SANITIZER

### BACKGROUND

[0001] This invention relates to a sanitizer for bedding.

[0002] After a guest of a hotel leaves, the linens (comprising the bed sheets and pillow slips) on the bed occupied by the guest are removed and replaced with freshly laundered linens in preparation for receiving the next guest. On the other hand, the heavier bedding – the pillows, blankets, and bedspreads – is normally cleaned only infrequently, typically by being sent out for drycleaning.

[0003] This same approach is used in hospitals, with linens of a bed being changed between patients, and heavier bedding being cleaned only infrequently, typically by drycleaning.

[0004] A drawback with this approach is that it compromises on the cleanliness of the bedding.

### SUMMARY OF THE INVENTION

[0005] A user of a bed, particularly if ill, may impart germs not only to the linens, but also to the heavier bedding. In such a situation, if the heavier bedding is not cleaned between users, there is a risk that the

next user of the bed may be exposed to these germs and possibly contract an illness.

[0006] Recognizing this problem, the present invention provides a sanitizer for bedding that has an irradiation chamber with a light support mounted for reciprocation within or adjacent the chamber and a light for radiating into the chamber supported by the light support.

[0007] In one aspect, a bedding support is mounted so as to be at least partially withdrawable from the chamber. In another aspect, the light is a narrow spectrum light. In a further aspect, there are a plurality of light supports mounted for reciprocation within or adjacent the chamber with each of the plurality of light supports supporting a light for radiating into the chamber.

[0008] Other features and advantages of the invention will become apparent from a review of the following description in conjunction with the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In the figures which illustrate example embodiments of the invention,

[0010] **FIG. 1** is a perspective view of a sanitizer made in accordance with this invention,

[0011] **FIG. 2** is a partially broken away perspective view of the sanitizer of **FIG. 1**,

[0012] **FIG. 3** is a cross-sectional view along the lines **4-4** of **FIG. 4**,  
[0013] **FIG. 4** is a cross-sectional view along the lines **3-3** of **FIG. 3**,  
[0014] **FIG. 5** is a perspective break out view of a portion of the sanitizer of **FIG. 1**,  
[0015] **FIG. 6** is a schematic side view of a portion of the sanitizer of **FIG. 1**,  
[0016] **FIG. 7** is a schematic side view of a portion of the sanitizer of **FIG. 1**,  
[0017] **FIG. 8** is an exploded perspective view of a portion of the sanitizer of **FIG. 1**, and  
[0018] **FIG. 9** is a schematic top view of a portion of the sanitizer of **FIG. 1**.

#### DETAILED DESCRIPTION

[0019] The present invention contemplates a method of operating a facility having beds. Such a facility could be a hotel, a hospital, or even an airplane where the seats of the plane act as beds for travellers. The method involves removing used bedding from a bed of the facility after departure of a user. The used bedding, or other bedding, is sanitized by irradiating the bedding with narrow spectrum radiation, such as ultraviolet ("UV") radiation. To provide more thorough sanitization, during the irradiation air may be circulated about the bedding. The bed is made up with the sanitized bedding.

[0020] This approach is particularly suited to heavier bedding, such as blankets, pillows, and bedspreads, which is not amenable to regular laundering. So that the method may best ensure a healthy

environment, used bedding may be replaced with sanitized bedding every time a new user of the bed departs.

[0021] Where the bedding comprises a blanket or a bedspread, sanitization may be facilitated by moving a narrow band radiation source (for example an ultraviolet light) along opposite sides of the blanket or bedspread at a stand-off from the blanket or bedspread. This may be accomplished by draping the blanket or bedspread over a support prior to exposing the bedding to narrow band radiation. In such instance, a narrow band radiation source may be moved under the support.

[0022] Where the facility is a multi-floor building, such as a hotel or hospital, it may be more cost effective to implement the method with one or more portable sanitizers that may be deployed on each floor to receive and sanitize used bedding as it is removed from each bed. Bedding, once sanitized, may then be returned to the bed from which it was removed, or find its way onto another bed.

[0023] A suitable sanitizer to effect the described method for blankets and bedspreads, such as duvets, is shown in the figures.

[0024] Turning to **FIG. 1**, a sanitizer **10** has a cabinet **12** with a pair of outwardly opening access doors **14a**, **14b**. Each door may be provided with a UV opaque window **20a**, **20b** to allow viewing of irradiation chambers **22a**, **22b**, respectively, inside cabinet **12**. The doors may have a latch (not shown) and opening handles **16**. The cabinet may be provided with a handle **17** (**FIG. 3**) and wheels **18** to make the sanitizer

**10** portable. A pair of butterfly valves **23a**, **23b** and a pair of vents **25a**, **25b** allow ambient air to be admitted into cabinet **12** when the ambient air pressure exceeds that inside the cabinet.

[0025] Referencing **FIGS. 2 to 5** along with **FIG. 1**, irradiation chamber **22a** is defined by a pair of perforated walls **24a** and **124a** supported on the floor **28** of cabinet **12**. Irradiation chamber **22b** is similarly configured with perforated walls **24b** and **124b**.

[0026] The inner face of the walls **70** of cabinet **12** is high gloss and embossed. Walls **70** may be fabricated of aluminum. A first pair of fixed, vertically directed UV lights **72a** extends between a side wall **70a** of cabinet **12** and adjacent wall **24a** of irradiation chamber **22a**. A further pair of UV lights **74b** extends between a side wall **70b** of cabinet **12** and adjacent wall **124b** of chamber **26b**. The UV lights emit narrow spectrum radiation at a germicidal wavelength, e.g., 2,537 Angstroms.

[0027] A fan **78** extends through floor **28** of cabinet **12** and forces air into a chimney **80** and through a side opening **82** of the chimney into the gap between the cabinet wall **70a** and wall **24a'**. Air deflectors **84** in wall **24a** deflect air flowing in the space between the cabinet wall **70a** and wall **24a** into the irradiation chamber **22a**. Irradiation chamber **22b** is similarly configured.

[0028] Wall **124a** of irradiation chamber **22a** and wall **124b** of irradiation chamber **22b** form a gap therebetween which accommodates horizontally directed UV lights **174** that are mounted to a carriage **33** which is supported between two screws **34**. Additionally,

each irradiation chamber is bi-sected by a pair of perforated walls **224** and **324** forming a gap therebetween which receives horizontally directed UV lights **174** that are mounted to a carriage **33** supported between two screws **34**.

[0029] The perforated walls **24a**, **124a**, **224**, and **324** may be made of stainless steel.

[0030] Each irradiation chamber **22a**, **22b** has a slidable U-shaped bedding support **32a**, **32b** which may be slid outwardly when the doors **14a**, **14b** are open. When fully inserted into an irradiation chamber, each bedding support surrounds the pair of perforated walls **224**, **324** bi-secting the chamber. Each bedding support is formed as a mesh with large openings to pass air and light. (Note that **FIG. 1** is shown with the bedding supports removed and **FIG. 2** with one support removed.)

[0031] The screws **34** are threaded along their length and may be made of carbon steel alloy C-1045 which does not require lubrication. With reference to **FIGS. 6** and **7**, each screw **34** extends through floor **28** and terminates in a bevel gear **36**. Each bevel gear is driven by a motor **38** through a series of bevel gears **40** and shafts **42**.

[0032] Each of the six screws is threaded with a first spiral thread **62** and a second spiral thread **64** arranged to form a "figure-8" pattern along the screw. The first and second spiral threads **62**, **64** meet at the top end of the screw **34** and at the base of the screw.

[0033] Turning to **FIG. 8**, An annulus **48** of a lifting assembly **44** surrounds each screw **34** and a tooth **50** fitted into a tube **52** extending from annulus **48** engages the threads of a screw **34**. A cap **54** threaded onto the tube **52** retains the tooth **50** in position. An inwardly directed flange **56** extends from annulus **48** and into a receptor in carriage **33**. With reference to **FIG. 9**, power may be transferred to lights **174** through a connector **90** which slides along a power bar **92**.

[0034] Sanitizer **10** is suited for use in sanitizing bedding, such as bedspreads and blankets. More specifically, doors **14a**, **14b** may be opened and each bedding support **32a**, **32b** slid outwardly. A bedspread or blanket **110** (**FIG. 2**) may then be draped over each support, the supports re-inserted into the irradiation chambers, and the doors closed. Thereafter, UV lights **74a**, **74b**, **174** may be illuminated and motors **38** and fans **78** activated. With the motors activated, the shaft and bevel gear arrangement rotates bevel gears **36** and, therefore, each of screws **34** in the same rotational direction. This rotational direction is such that as a screw **34** rotates, its lifting assembly **44** moves upwardly along the first spiral screw thread **62**. Thus, the lifting assemblies of each of the six screws act to lift the UV lights **174**.

[0035] Once the lifting assemblies reach the upper end of the screws **34**, continued rotation of the motors causes the tooth of each lifting assembly to track the second spiral screw thread **64** of the screw **34**. In consequence, the lifting assemblies now move downwardly so that the lifting assemblies act to lower the UV lights **174** until the lights return to their lowermost position. At this point, the tooth of each lifting



assembly begins again to track the first spiral screw thread **62** of the screw **34**. As a result, the UV lights **174** repeatedly reciprocate as the motors continue to rotate. The reciprocation of UV lights **174** exposes the entire adjacent face of the blanket/bedspread to the UV light while assisting in assuring that the bedding inside the sanitizer does not overheat.

[0036] It will be apparent that with this arrangement, the UV lights **174** may be reciprocated by simply rotating the motors in one rotational direction. Of course, a less elegant alternative would be to replace the screws with ball screws and control the motors to switch rotational direction at each end of the stroke of the bedding supports.

[0037] In contrast to UV lights **174**, UV lights **74a**, **74b** are fixed. However, the circulated air assists in ensuring the bedding inside the sanitizer does not overheat.

[0038] During sanitization, fans **78** circulate air in the irradiation chambers **22a**, **22b**. The embossments of the inner surface of the walls **70** of cabinet **12** reflect the UV light in all directions and impart turbulence to the circulating air. This turbulent air acts to dislodge loose particles on or in the bedding. Throughout, the UV lights emit UV radiation into the irradiation chambers which acts to neutralize germs (e.g., bacteria) exposed to the light.

[0039] The sanitation of the bedding in the sanitizer **10** may continue for a period of time in order to sufficiently sanitize the pillows. Thereafter, the UV lights may be extinguished and the motors and fans

de-activated so that the doors **14a**, **14b** may be opened and the sanitized bedding removed.

[0040] The sanitizer may have a control panel (not shown) used to control parameters of the sanitizer such as the period of sanitization.

[0041] As an alternative to using UV light, far-infrared radiation may be used to sanitize the bedding in the sanitizer. In such instance, the bedding should be first wetted with a small amount of water. This technique is further described in U.S. publication number 2002 00 95946 published July 4, 2002, the contents of which are incorporated by reference herein. A drawback with this approach is that it may take considerable time to dry the bedding.

[0042] Other modifications will be apparent to those skilled in the art and, therefore, the invention is defined in the claims.